INNOVATIONS IN RURAL AND AGRICULTURE FINANCE

Biometric Technology in Rural Credit Markets: The Case of Malawi

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Identity theft is a common crime the world over. In developing countries, the damage caused by identity theft and identity fraud goes far beyond the individual victim, however, and ultimately creates a direct impediment to progress, particularly in credit markets. Recent research reveals that biometric technology can help reduce these problems.

A biometric is a measurement of physical or behavioral characteristics used to verify or analyze identity. Common biometrics include a person's fingerprints; face, iris, or retina patterns; speech; or handwritten signature. These are effective personal identifiers because they are unique and intrinsic to each person, so, unlike conventional identification methods (such as passport numbers or government-issued identification cards), they cannot be forgotten, lost, or stolen.

Recent advances in recognition technology coupled with increases in both digital storage capacity and computer processing speeds have made biometric technology (for example, ocular or fingerprint scanners) feasible in many applications, from controlling restricted building access to allowing more effective delivery of targeted government programs with large-scale identification systems, such as those being implemented in India by the Unique Identification Authority of India.

Biometric technology can also improve access to credit and insurance markets, especially in countries that do not have a unique identification system, where identity fraud—the use of someone else's identity or a fictitious one—to gain access to services otherwise unavailable to an individual is rather common. For example, lenders in Malawi describe past borrowers who purposefully defaulted then tried to obtain a fresh loan from the same or another institution under a false identity. And, although less common in developing countries because markets are less developed, the potential for sick individuals without healthcare coverage to use the insurance policy of a friend or relative does exist. The response of lenders and insurance companies has been to restrict the supply of such services to the detriment of the greater population, not just those people committing identity fraud.

In the case of credit, biometric technology can make the idea of future credit denial more than an empty threat by making it easier for financial institutions to withhold new loans from past defaulters and reward responsible past borrowers with increased credit. As a result of this inability to "cheat the system," individuals may take out smaller loans that they are able to repay or avoid borrowing altogether if they cannot pay back any debt. Borrowers may have greater incentives to ensure that production is successful, either by exerting more effort or choosing less risky projects, and—whenever production could cover the loan repayment—borrowers may be less likely to default intentionally or opportunistically.

To look at the impact of biometric technology, Giné, Goldberg, and Yang (2009) implemented a field experiment using 3,200 smallholder paprika farmers in four locations in Malawi who applied for an agricultural input loan in 2007. Farmers in the study were randomly allocated to either a control group or a treatment group; each member in the latter group had a fingerprint collected as part of their loan application and an explanation that this would be used to determine their identity on any future applications. (Fingerprint recognition was used instead of face, iris, or retina recognition because the technology has been commercially available since the early 1970s, and there is a highly competitive market for it. Therefore, it is inexpensive, well known, and widely used.) Both treatment and control groups were given a training session on the importance of credit history in ensuring future access to credit.

The study shows that within the subgroup of farmers who had the highest ex ante default risk, fingerprinting led to increases in repayment rates of about 40 percent. By contrast, fingerprinting had no impact on repayment for farmers with low ex ante default risk. These higher repayment rates are due to fingerprinted borrowers requesting smaller loan amounts to ensure they would be able to repay them and devoting more land and inputs to paprika, thus diverting fewer resources to other crops; the same cannot be said for their nonfingerprinted counterparts.

A rough cost–benefit analysis of the pilot experiment suggests that the benefits from improved repayment greatly outweigh the costs of biometric equipment and fingerprint collection, which accounts for basic training and the time it takes credit officers to collect biometric data. These costs, however, do not include a full implementation plan, which would likely require software integration, expanded data-storage facilities, upgraded equipment, and more in-depth staff training.

Challenges in the implementation of biometric systems

Despite the encouraging results from the pilot in Malawi and the success of biometric technology in controlled laboratory environments, there are still concerns and challenges when collecting and using such information in real life and when trying to establish an identification system at a national level.

- Not everyone can participate in a fingerprint-based identification system. Fingerprints can be unrecognizable due to cuts or burns. In addition, older individuals may have fingerprints that have worn with age, and the operation of fingerprint readers may be jeopardized due to arthritis. In some areas, especially those with past or present conflict, individuals may lack fingers altogether. In the most comprehensive study to test the process and customer attitude during the recording of biometric information, the United Kingdom passport service trial reports an enrollment success rate of 100 percent for the 9,250 nondisabled participants and 96 percent for the 750 disabled participants. In Malawi, only about 2 percent of the sample of 1,600 fingerprinted farmers had to have their left thumbprint recorded when the scanner failed to capture

the required right thumbprint. This is surprising, as it turns out, because many Malawian farmers grow tobacco, which requires the heavy use of fingertips in the transplant of seedlings. Over the years, their fingerprint ridges may become too worn to be read or captured by a fingerprint scanner.

- The accuracy of biometric technology remains, to a large extent, untested. Biometric companies report very high accuracy rates from highly controlled trials that typically use artificially generated data. However, because the performance of a technology depends greatly on the context in which it is used, trials using real-life data are far less impressive. For example, the United Kingdom passport service trial reports that only 80 percent of the participants could be correctly verified by their fingerprints, and younger individuals were more successfully identified than older ones. In Malawi, however, everyone selected during demonstration sessions was correctly identified.
- Individuals may have a negative attitude toward providing their biometrics. People may be reluctant to place their fingers on scanners due to hygiene concerns. More importantly, there is the widespread public perception that fingerprinting is linked to the criminal justice process. Therefore, in conflict-affected countries that are stricken by ethnic infighting, individuals may refuse to provide biometrics for fear of persecution by authorities or others who could gain illegal access to such biometric records. The parliamentary debates concerning the United Kingdom's identification cards bill revealed that 55 percent of poll respondents thought the collection of biometric information was an infringement of civil liberties. The authors did not encounter any such resistance from farmers in Malawi, perhaps because the technology was very novel.
- The cost of collecting biometrics can be high. The estimates are sparse, and detailed cost–benefit analyses have not been systematically conducted. However, the costs of using different types of biometric technology—from basic fingerprinting techniques to voice- and iris-recognition software—can be prohibitively expensive. In India there are legitimate concerns that the costs of rolling out biometric technology may mean a huge opportunity cost for more than 700 million Indians living in poverty to receive social benefits. In the United Kingdom, a critical report by several researchers at the London School of Economics and Political Science found that the government underestimated the implementation of the Identity Cards Bill. The report suggests that the ten-year rollout would cost between 10.6 billion and 19.2 billion pounds (compared to the government estimate of 5.84 billion pounds over the same period), excluding public- or private-sector integration costs.
- Biometric technology is not infallible. While biometric identification systems can help combat identity theft, fraud, and money laundering, they are essentially technological applications and, as with any other technology, can be hacked or infiltrated. These systems therefore run the risk of having data fall into the wrong hands. Since biometric technology is only being piloted on a large scale in some pockets of the world at present, legitimate concerns on privacy do arise. For example, it is possible to imagine that identification-database workers will be threatened, blackmailed, and possibly corrupted. After all, the perpetrators of 80 percent of all computer security lapses are not hackers, but employees.
- It is important that a common platform be used if biometric data are merged with other datasets. Biometric data are stored in formats that may not be compatible with the information systems of other government agencies, so an effort must be made to have compatibility if biometrics are to serve as the basis for a national identification system.

Conclusion

Despite these concerns, biometric technology presents an exciting and innovative opportunity for increased access to financial markets and better delivery of social assistance programs such as conditional cash transfers, aid distribution, or subsidized inputs or commodities. Whether it can be scaled up effectively and used to resolve identification and authentication issues is a challenge that requires more research. ■

For further reading: X. Giné, J. Goldberg, and D. Yang, "Identification Strategy: A Field Experiment on Dynamic Incentives in Rural Credit Markets," mimeo (Washington, D.C.: World Bank, 2009); U.S. General Accounting Office, *Using Biometrics for Border Security* (Washington, D.C.: 2002); London School of Economics and Political Science (LSE) Identity Project, www.identityproject.lse.ac.uk.

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